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BATS OF THE HENRY MOUNTAINS REGION OF SOUTHEASTERN UTAH

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There are few publications on distribution and abundance of bats in southeastern Utah. Durrant (1952), then Shuster (1957), summarized information for the state as of the 1950s but only occasional publications have appeared since then. In particular, little information is available on bats in the Henry Mountains. The Henry Mountains lie in a remote area on the Colorado Plateau of Utah, just north and west of Lake Powell. The Henrys were the last-named (1869, by John Wesley Powell) and last-surveyed (1935-39, the last U. S. Geological Survey expedition undertaken from pack animals) mountains in the contiguous United States (Hunt et al., 1953). Given the paucity of information available on bats in this area, we commenced a series of annual surveys and explorations in 1993 and preliminary information from these surveys is presented herein.

Our work has been generally within the Henry Mountains region as defined by Hunt et al. (1953), that is the area lying between the boundary of Glen Canyon National Recreation Area on the south, between the eastern boundary of Capitol Reef National Park on the west, and the Dirty Devil River to the east. Our northern boundary is the Fremont River Valley, whereas Hunt included the San Rafael Swell still farther north. The study area is ovoid, approximately 40 mi wide by 54 mi long (64 x 87 km), and includes portions of Wayne and Garfield counties. The topography of the region is dominated by three major peaks (Ellen, Pennell, and Hillers), which rise over 11,000 ft (3,353 m), and two lesser mountains (Holmes and Ellsworth) in the southeastern part of the study area, which rise over 7,800 ft (2,377 m). The mountains resulted from volcanic intrusions during the Tertiary, which formed domes in the host shale and sandstone. In time, erosion exposed the domes on the mountain peaks (Hunt et al., 1953). The peaks are surrounded by the outwashed pediment (Fig. 1) that gives way on the east and south sides of the area to spectacularly dissected, 2,000-foot-deep (610 m) sandstone canyons. The lowest elevations in the study area, below 3,900 ft, (1,189 m) are in these canyons. Other conspicuous landforms include badlands, barren mesas, and dramatic folds on the west side, and arches and sand dunes on the east side. The impassable landscape and inhospitable climate are the chief reasons for the continuing regional isolation.

The climate of the plateau around the Henry Mountains is characterized as arid to semiarid. Upper elevations receive substantially more precipitation than do low-lying areas. For example, Mount Ellen (11,500 ft; 3,505 m) has a mean annual precipitation of about 30 in (76 cm). In contrast, the mean annual precipitation at both Hanksville (4,308 ft; 1,313 m) and Bull-

Figure 1. Mount Hillers (far left) and Mount Pennell (near right), looking southeast from South Summit ridge on Mount Ellen.

frog Basin (3,822 ft; 2,689 m) is about 5 in (13 cm). Hanksville is on the northern margin of the study area whereas Bullfrog Basin, a marina on Lake Powell, is approximately 5 mi (8 km) from the southern boundary of the study area. According to Hunt et al. (1953) and Downs et al. (1990), the mean winter daily minimum temperatures (in January) at these two locations are 11° and 23°F (-12° and -5°C), respectively; the mean summer daily maxima (July) are 98° and 100°F (37° and 38°C). The mean total annual pan evaporation at Hanksville is 70 in (178 cm). Spring winds can be fierce.

There are no temperature data for the mountains but the major peaks are covered in snow throughout the winter. Nevertheless, Hunt (1980*a*) stated that the Henry Mountains were never glaciated like surrounding mountain ranges of comparable elevations. Freeze-thaw boulder fields, periglacial deposits, and stony colluvium suggest the temperature on the peaks was low enough, but because the Henry Mountains are in the rain shadow behind Boulder Mountain and the Aquarius Plateau, there has never been enough precipitation for ice to accumulate. All drainages at upper elevations are active during snowmelt, but only the largest of them run water into late summer. None of the streams flow continuously to their points of discharge into the Fremont, Dirty Devil, or Colorado rivers. In fact, most are intermittent below 5,000 ft (1,524 m). There are nearly 200 documented springs in the area (Goode, 1980), but at least 75 percent are little more than seeps. There are only five springs that yield as much as 100 gpm (379 L) in a normal year. Our experience is that spring discharges greatly vary among years and seasons.

Neese (1980) identified seven vegetational zones in the study area. These are as follows (number of communities in parentheses): alpine (2), subalpine (2), montane (3), ponderosa pine-mountain brush (2), pygmy forest (2), cool desert shrub (8), and warm desert shrub (2). The dominant plant species for each of the zones are typical for comparable elevations and latitudes elsewhere in the southwestern United States. The individual communities were further characterized as complex and intergrading, creating some unusual assemblages. These assemblages result from the extremely varied topography, the extreme elevation change (nearly 8,000 ft in 25 mi), and associated changes in climate, and the wide range of rocks and soils on which the plants

must grow. Figure 2-4 are examples of habitat extremes encountered in the Henry Mountains. The soils derive from Permian to upper Cretaceous sedimentary strata, as well as from granite and recent alluvial and colluvial deposits. Downs et al. (1990) identified the plant communities associated with specific soil types, but their work was restricted to sites suitable for grazing of livestock. Neese (1980) reported the occurrence of three endemic plant species in the Henry Mountains, all from montane areas.

According to Hunt et al. (1953), the region has always been sparsely populated. Small communities of several cultures of prehistoric peoples occupied the canyons and piedmont of the Henry Mountains. The first recorded Europeans were a party from the Powell Survey, led by A. H. Thompson, who crossed the mountains in 1872. In 1875, G. K. Gilbert, previously part of the Powell Survey, was there on the first of two trips that resulted in his classic geological study. From the 1870s to about 1900, the Henry Mountains, along with the more famous Robbers Roost just across the Dirty Devil River, provided sanctuary for many outlaws of the time (Baker, 1968). Mormons established the first of several communities along the Fremont River in 1882, but only Hanksville, and the more diffuse community of Caineville, survive to the present. Gold was discovered on Mount Ellen in 1890 but the resultant community of Eagle, on Crescent Creek, lasted only until 1900, when most of the mines failed. Ticaboo, a small company town in the southern part of the study area, is a consequence of the uranium boom of the 1950s. In 1990, Hanksville had a population of 324. Population counts attributable to either Caineville or Ticaboo have not been located.

The far greatest part of the study area is public lands administered by the Bureau of Land Management (BLM) Henry Mountains Resource Area office in Hanksville. Grazing, farming, and mining are the chief land uses. Virtually all farming is sustained by seasonal irrigation, and most of it is along the Fremont River. All of these land uses include some private holdings. There are perhaps six inhabited ranches in the uplands, some in continuous operation since the early 1900s. Mining interests in the 1950s, and the closing of Glen Canyon Dam, stimulated the construction of the first roads passable by conventional vehicles. At this writing one gold mine is being redeveloped. We have periodically observed placer mining, but the abandoned

Figure 2. The formations locally known as Little Egypt at the northeastern base of the Henry Mountains.

Figure 3. Sawmill Basin, with Mount Ellen in the background, on the north side of the Mountains.

Figure 4. Sandstone and dunes, near Ticaboo, in the eastern part of the study area.

equipment along Crescent Creek is testimony to marginal returns created by small deposits and an uncertain water supply. The potential for uranium mining still exists but current prices hover just below economic feasibility levels. The mill in Ticaboo is reported to be reopening, but not to exclusively process locally produced ore. Timber was never harvested to any great extent, but large tracts of piñon-juniper have been chained, and the land reseeded to grass, to improve grazing for livestock and bison. Hunt et al. (1953) and Hunt (1980*b*) deal at some length with the historical changes to the landscape in the region. Many of the undesirable changes resulted from overgrazing. We have observed increasing social infrastructure development (e.g., roads) and new service-oriented industries (e.g., convenience stores, boat shops, and motels) in areas nearest Lake Powell. Similarly, motels and campsites have appeared near the boundary of Capitol Reef National Park. Former state sections continue to be privatized and improved with mixed success.

The mineral deposits (e.g., uranium, vanadium, silver, gold, coal, gemstones) and Gilbert's revelation on the origin of these mountains have subjected the Henrys to intense geological inquiry for over 100 years (Picard, 1980), but there has not been a corresponding interest in the animals. W. H. Osgood made the first collection of mammals in the region in 1908 (Goldman, 1931), but apparently no bats were obtained. According to Stanford (1931), a party from the University of Utah collected mammals, including *Pipistrellus hesperus*, and other biota on the King Ranch in September 1929. For the intervening period, the holdings at the Utah Museum of Natural History (UMNH) and Brigham Young University (BYU) revealed several small but significant mammal collections from the Henry Mountains. In 1952 a class from the University of Utah spent three days there, but no bats were obtained. During 1954-57, M. R. Lee did collect a few bats incidental to studies on other mammals, but there were no bats among the specimens prepared by G. L. Ranck in 1964. These collections elicited recognition of three races of mammals endemic to the Henry Mountains, *Eutamias umbrinus sedulus* White, 1953; *Thomomys bottae dissimilis* Goldman, 1931; and *Microtus longicaudus incanus* Lee and Durrant, 1960. Hasenyager (1980) summarized all bat records for Utah known to that date and recorded specimens of *Myotis californicus*, *M. ciliolabrum*, *M. lucifugus*, *M. volans*, and *Eptesicus fuscus* from the region. Hall (1981) provided additional information on potential bat species occurring within the study area but listed no new locality records.

METHODS AND MATERIALS

Bats were captured in mist nets set over water, or in flyways, during the summers of 1993 (19 net-nights), 1994 (3), 1995 (42), and 1996 (30), and our procedures generally followed those of Kunz and Kurta (1988). Mist nets of varying sizes were deployed shortly before sunset and attended continuously until closure. Bats were promptly removed from nets, identified and examined for data collection, and released unharmed. Species, sex, age (adult or young of year based on epiphyseal fusion; Anthony, 1988), reproductive condition (testes or cauda visible in males, females pregnant, lactating, postlactating, or non reproductive; Racey, 1988), and time of capture were noted. For each netting episode, we recorded the investigator's name, site location, date, number and size of nets, times nets were opened and closed, starting and ending temperature, cloud cover, wind speed, and brief habitat description. Additional comments on parasites, wing damage, and the like were made as necessary. All data were recorded on standardized data sheets; completed data sheets are on file at the Albuquerque office of the Midcontinent Ecological Science Center or Department of Civil Engineering, Texas Tech University, Lubbock. Data were entered into spreadsheet files for summarization.

Netting localities, all in Garfield County, Utah, are (Mt. Hillers) Starr Springs Campground, 6,100 ft; (Mt. Hillers) 3 mi W (by rd) Starr Springs Campground, 6,100 ft (Woodruff Cabin); (Mt. Hillers) 2.8 mi NE Starr Springs CG, 6,600 ft (Gold Creek Development); (Mt. Pennell) Hancock Spring, 1.5 mi N Mt. Pennell, 8,900 ft; North Maidenwater Creek, 0.5 mi E Maidenwater Spring, 4,720 ft; Hog Canyon, 0.25 mi W Hwy 95, 4,140 ft; Mt. Pennell, Mud Spring, 1.25 mi W Stanton Pass, 7,750 ft; Mt. Pennell, Horn Spring, 1 mi S The Horn, 8,600 ft; Mt. Ellen, Birch Spring, 7,860 ft; Mt. Ellen, Mud Spring, 2.2 mi ENE Bromide Basin, 8,280 ft; Mt. Ellen, Copper Basin Spring, 8,710 ft; Mt. Ellsworth, Highway Reservoir, 3.4 mi NE Ticaboo, 4,700 ft; Mt.

Ellsworth, Lost Spring Reservoir, 1.6 mi NNE Ticaboo, 4,810 ft; Mt. Hillers, Cass Creek Reservoir, 6,800 ft; Mt. Ellen, Crescent Creek, 1.8 mi ENE Bromide Basin, 8,250 ft (Crescent Creek 4-way); Poison Spring Canyon, Wall Spring, 4250 ft; Poison Spring Canyon, 1.4 mi W (by rd) Wall Spring, 4380 ft; Mt. Ellen, Placer Reservoir #1, ca. 0.7 mi ENE Mud Spring, 7,580 ft; Butler Wash, Cottontail Spring, 4770 ft; Mt. Ellen, Crescent Creek, 5,580 ft; Mt. Ellen, Bromide Basin, 10,100 ft (Bromide Basin Placer); Mt. Pennell, Airplane Spring, 7,660 ft. Names in parentheses refer to the peak on which the locality occurs or to abbreviated locality names used in Table 1. Place names not on USGS maps, particularly for springs and reservoirs, are those employed by BLM. Unless distance and direction are specifically indicated to be by road or trail, capture localities are reported as straight-line measurements obtained from map landmarks in the cardinal compass direction stated.

Times of net closure varied for many reasons, but most often we netted until bat activity diminished significantly (approximately 30-45 min after last bat capture). No capture site was visited every year because dates of visits, access to sites, and presence of water varied among years. Several sites have been netted only once. Numbers of bats captured per night may include some (presumably few) recaptured individuals as we made no attempt to mark them. Capture and handling of bats followed standard protocols of the American Society of Mammalogists (1987) and Midcontinent Ecological Science Center, USGS. Capture permits were granted by the Utah Division of Wildlife Resources. Photographs of specimens, together with a GPS device (Fig. 5), and a small number of voucher specimens were employed to confirm identification or establish new geographic records. Specimens and photographs are housed in the USGS Biological Survey Collection in Albuquerque. Scientific and common names of bats generally follow Jones et al. (1992).

RESULTS

We netted 94 net-nights during the springs and summers of 1993 through 1996 at 22 localities, ranging in elevation from 4,140 to 10,100 ft, and captured 572 bats of 15 species. The earliest netting date was 15 May; the latest was 14 August. We confirmed the presence of nine additional species to the known bat

Figure 5. Documentation of the capture of *Euderma maculatum* at Mud Spring, on Mount Pennell.

fauna of the region. The most abundant species (numbers of individuals in parentheses) were *E. fuscus* (94), *M. evotis* (75), *Lasionycteris noctivagans* and *M. volans* (71), *P. hesperus* (64), and *Tadarida brasiliensis* (50; Table 1). Species taken at the most localities (number of localities in parentheses), an index of local distribution, were *M. volans* (13), *M. evotis* and *M. californicus* (12), *P. hesperus* (11), *M. thysanodes* (10), *M. yumanensis* and *Antrozous pallidus* (9), and *E. fuscus* (8; Table 1). Additional data are presented in the following brief species accounts:

Myotis californicus.— The California myotis occupies suitable habitat in all but the northern quarter of Utah. The only previous record from the Henry Mountains is from Sawmill Basin on Mount Ellen (Hasenyager, 1980). We captured 44 individuals (Table 1) of this diminutive myotis at 12 sites ranging in elevation from 4,250 to 8,900 ft (1,295-2,713 m). Months of capture are May, June, and August. Individuals from the Henry Mountains represent the race *M. c. stephensi*, as would be expected on geographic grounds (Hall, 1981).

Myotis ciliolabrum.— This species appears to be distributed statewide in suitable habitat at upper elevations. There is a previous record from the Henry Mountains from Starr Springs (see the account of *M. lucifugus*). This species does not appear to be particularly common in the Henry Mountains; we took only eight individuals from three localities that range from 7,660 to 8,900 ft (2,335-2,713 m) in elevation (Table 1). Months of capture are June and August. This species is difficult to distinguish from *M. californicus* and field identifications should be made with care. The local race is *M. c. melanorhinus*.

Myotis evotis.— The long-eared myotis likely occurs throughout Utah; however, there are no previous records from the Henry Mountains. The nearest records were from Garfield (Bryce Canyon National Park) and San Juan (Navajo Mountain and Blanding) counties (Hasenyager, 1980). Interestingly, our work to date suggests that this is one of the most common species in the mountains. We captured 75 individuals at 12 different sites from May through August (Table 1). Elevations of capture range from 4,700 to 8,900 ft (1,433-2,713 m). We inadvertently captured one individual as we moved a mist net over a pool at Gold Creek development. This bat was apparently foraging between the net and water for several minutes prior to its capture. Manning (1993) states that *M. e. chrysonotus* is the race occurring in southeastern Utah.

Myotis lucifugus.— Shuster (1957) suggested that the range of this species in Utah was the northern two-thirds of the state. Hasenyager (1980) believed that *M. lucifugus* was more widely distributed and occurred in suitable habitats statewide except in portions of southwestern Utah. We have examined the specimen listed by Hasenyager (1980) for the Henry Mountains (UMNH 12446, S. D. Durrant 3525, taken 7 Aug 1955 at Starr Spring, Mt. Hillers, Garfield County) and it is not *M. lucifugus* but rather *M. ciliolabrum*. Extensive work (Bogan, unpublished data) in areas east and west of the Henry Mountains suggests that *M. lucifugus* does not occur in this part of Utah. Other nearby records of *M. lucifugus* reported from Bluff in San Juan County (to the southeast) and Bicknell and Boulder Mountain, in western Wayne County (to the northwest; Hasenyager, 1980), and preferably specimens from throughout Utah, should be re-examined to ascertain their identity. Presumably, the race in Utah is *M. l. carissima*.

Myotis thysanodes.— The fringed myotis may occur throughout Utah (Hasenyager, 1980), but at present is known only from some southern and eastern counties. Previous records of occurrence nearest the Henry Mountains are Bryce Canyon and Mammoth Cave. This species is moderately common in the mountains; we captured 34 individuals in May, June, and August, at ten localities ranging from 4,250 to 8,900 ft (1,295-2,713 m) in elevation (Table 1). We found them to be slightly more common early in the summer and at lower elevations. The race of this bat occurring in Utah is nominate *M. t. thysanodes*.

Myotis volans.— The long-legged myotis likely occurs in suitable habitat throughout Utah; the two previous records (Hasenyager, 1980) from the Henry Mountains, Sawmill Basin and Eagle, are both on Mount Ellen. This species is widespread and abundant in the Henry Mountains region. We captured 71 individuals at 13 localities ranging from 4,720 to 10,100 ft (1,439-3,078 m) in elevation (Table 1). All our records for

Table 1. Elevational and Temporal Distribution of Bats Captured in the Henry Mountains, 1993-96. Capture locations are listed by elevation, in descending order. Bat species are listed in ascending order of their mean elevation of capture. Multiple capture dates at a single location are listed by latest to earliest date. The abbreviations used for bat species, listed aplhabetically, are as follows: An pa, Antrozous pallidus; *Eu ma,* Euderma maculatum; *Co to,* Corynorhinus townsendii; *Ep fu,* Eptesicus fuscus; *Id ph,* Idionycteris phyllotis; *La ci,* Lasiurus cinereus; *La no,* Lasionycteris noctivagans; *My ca,* Myotis californicus; *My ci,* M. ciliolabrum; *My ev,* M. evotis; *My th,* M. thysanodes; *My vo,* M. volans; *My yu,* M. yumanensis; *Pi hi,* Pipistrellus hesperus; *and Ta br,* Tadarida brasiliensis.

LOCATION	ELEV	DATE	Pi he	My th	An pa	My ca	Co to	Id ph	My yu	Ep fu	Ta br	La ci	My ev	My vo	Eu ma	My ci	La no	TOTAL
			f m	f m	f m	f m	f m	f m	f m	f m	f m	f m	f m	f m	f m	f m	f m	
Bromide Basin Placer	10,100	09 Aug 96												1				1
Hancock Spr.	8,900	14 Aug 96		2		1							2 9	4 7		1		26
"		21 Jul 94		:		:							: 1	: 5		:		6
Cooper Basin Spr.	8,710	05 Aug 96	1	2		1							1 2	3 1		:		11
"		23 Jun 95	:	:		:							: :	1 :		:		1
Horn Spring	8,600	30 Jun 95	:	:		:			3	11		1	: 1	2 :		:	55	73
"		20 Jun 95	:	:		:			:	1 :			: :	: :		:	6	7
Mud Spr., Ellen	8,280	22 Jun 95	:	:		:			:	: :			: :	1 :		:	:	1
Crescent Cr. 4-way	8,250	01 Jul 95	:	:		:			1	: :			: :	7 :		:	1	9
Birch Spring	7,860	10 Aug 96	5 7	:	2	2 3	1	4	:	9 3			1 1	4 1		:	:	43
"		21 Jun 95	: :	:	:	: 1	:	:	1	3 9			: 1	: 8		:	5	28
Mud Spr., Pennell	7,750	19 Jun 95	: :	:	:	: :	:	:	:	: 2			2 3	1 1	1	2 4	2	18
Airplane Spring	7,660	13 Aug 96	3 3	4	2 1	1 4	6 2	:	:	: :			: 36	1 7		1	:	71
Placer Res. #1	7,580	19 May 96	: :	:	: 1	: :	: :	:	1	: 3	8 36		: :	: :			:	49
Cass Cr. Res.	6,800	29 Jun 95	: :	:	: :	: :	: :	:	:	: 1	: :		: :	: :			:	1
Gold Cr. Dev.	6,600	28 May 93	: :	:	: :	1 :	: :	:	1	33 7	: :		: 2	: 1			1	46
"		23 May 95	: :	:	: :	: :	: :	:	:	: 1	: :		: 1	: :			:	2
Woodruff Cabin	6,100	27 May 93	: :	:	: :	: :	: :	:	:	:	: :		: :	1 :			:	1
"		26 May 93	: :	1 :	: :	1 1	: :	:	:	:	: :		1 :	4 2			1	11
Starr Spr. CG	6,100	07 Aug 96	: :	: 1	: :	1 :	: 1	1	:	:	: :		2 :	: :				6
"		26 May 93	: :	: :	: 1	: :	: :	:	:	:	1 :	1	: :	: :				3
"		25 May 93	: :	: :	: :	: :	: :	1	:	:	:		2 :	2 1				6
"		24 May 93	: :	: :	: 1	1 :	: :	:	:	:	:		2 :	: :				4
Crescent Cr. Placer	5,580	06 Aug 96	1 1	: :	: :	: :	: :	:	:	:	:		: :	: :				2
Lost Spr. Res.	4,810	25 Jun 95	5 6	2 :	1 2	1 2	: 1	1	:	:	:		: 1	: :				22
Cottontail Res.	4,770	20 May 96	1 1	8 3	3 1	4 :	: :	:	1 :	:	:		:	: :				22
Maidenwater Cr., No.	4,720	25 May 95	: :	: :	: :	: :	: 1	:	: :	1	:		:	: :				2
"		24 May 95	: :	: :	1 :	: :	: :	1	: :	5	:		:	1 :				8
"		14 May 96	: 1	6 1	: :	13 :	2 :	1	1 :	2	:		2	3 1				33
Highway Res.	4,700	24 Jun 95	4 3	3	1 1	2 1	:		1 2	:	:		2					20
Poison Spr. Can., mid.	4,380	16 May 96	3 :	:	:	:	:		1	:	5							9
Wall Spring	4,250	15 May 96	8 9	1	2	3	2			3								28
Hog Canyon, Low.	4,140	18 Jun 95	2															2
		Captures by Sex	31 33	21 13	8 12	30 14	9 7	9 0	4 9	57 37	9 41	1 1	17 58	35 36	1 0	2 6	0 71	
		TOTAL CAPTURES	64	34	20	44	16	9	13	94	50	2	75	71	1	8	71	572

this species at localities below 6,600 ft are from May. Conversely, records of this species from elevations between 7,660 and 10,100 ft are from June through August, suggesting that this species (perhaps chiefly females, to give birth and raise young) migrates to upper elevations as weather warms in summer. Bats of this species in Utah belong to the race *M. v. interior*.

Myotis yumanensis.— There are no previous records of this species from the Henry Mountains. There are older records of the Yuma myotis from Fruita (Wayne County) and at 88 (Kane County), 137, and 129 (Garfield County) "river miles" north of Lee's Ferry on the Colorado River (Hasenyager, 1980). There is another record from Old Woman Wash, 23 mi north of Hanksville, Emery County. This is not one of the more common species in the Henrys; we netted 13 individuals at nine sites that range from 4,380 to 8,600 ft (1,335-2,621 m) in elevation (Table 1). All our records are from dates before 1 July, suggesting that perhaps this species occurs in the mountains only early in the season, after which time it likely occurs at lower elevations along permanent watercourses, as is typical for this species. The race occurring in Utah is *M. y. yumanensis* (Harris, 1974).

Lasiurus blossevillii.— There are no records of the western red bat anywhere near the Henry Mountains, and work nearby (Bogan, unpublished data) suggests that this species is absent or very uncommon in this part of Utah. Previous records for this species (as *L. borealis*) are from Washington and Carbon counties (Hasenyager, 1980). There also is a specimen from Utah County (BYU 13319). All these locations are at least 150 mi from the Henry Mountains. We surmise that this migratory species occurs only rarely in most of Utah, although there may be predictable seasonal populations in Washington County during the summer months. Baker et al. (1988) and Morales and Bickham (1995) have demonstrated that *L. blossevillii* is specifically distinct from the eastern *L. borealis*. The race occurring in Utah is *L. b. frantzii*.

Lasiurus cinereus.— Few specimens of the hoary bat from Utah appear to exist (Hasenyager, 1980), but the distribution of these few specimens suggests statewide occurrence. The nearest records to the Henry Mountains are near Bryce Canyon and Blanding. We captured two individuals, one of each sex, at two locations (Table 1). The female, as expected, was captured in late May (6,100 ft; 1,859 m), probably during migration (Findley and Jones, 1964), and the male was taken in late June (8,600 ft; 2,621 m). Males probably occur throughout the summer in the mountains, roosting solitarily in trees.

Lasionycteris noctivagans.— Silver-haired bats likely occur statewide in suitable habitat. There are no previous records for the Henry Mountains. The nearest records (Hasenyager, 1980) are from Escalante and near Bryce Canyon (Garfield County) and near Bicknell (Wayne County). All individuals captured were males; females of this species appear to summer in the east. This species is locally common at times; on 30 June 1995 we captured 55 individuals (Table 1). This date seems too late for the northern migration and, because all were males, we believe the species may be a regular summer resident at upper elevations in the Henry Mountains. All individuals were netted between 6,100 and 8,600 ft (1,859-2,621 m) in elevation. There were no August captures. As far as is known, male silver-haired bats roost solitarily in cracks and under bark of trees (Mattson et al., 1996). Total captures were 71 individuals at six localities; capture localities were at elevations ranging from 6,100 to 8,600 ft.

Pipistrellus hesperus.— This species probably occurs statewide in Utah, at least at lower elevations, but there is no documentation of specimens from extreme northwestern and northeastern Utah. There are records of this species in the Henry Mountains. Stanford (1931) reported that "the most interesting feature of the evening spent on King's ranch was the abundance of bats flitting about the house and corrals. Two distinct sizes were seen. One was dropped with fine shot and one knocked down by Professor Fiske with his fly rod. The smaller one proved to be of this species." Hardy (1941) reported a specimen, seemingly in the Dixie Junior College collection, from "King's ranch at base of Henry Mountains." There also are specimens from Starr Spring and Ekker's ranch, 25 mi SE Hanksville (Hasenyager, 1980). The latter location may not be in the present study area. We found this species to be common (64 individuals, 11 locations) in May, June, and August (Table 1) in the Henry Mountains at elevations ranging from 4,140 to 8,710 ft (1,262-2,655 m). The western race, *P. h. hesperus*, is the one occurring in Utah (Findley and Traut, 1970).

Eptesicus fuscus.— The big brown bat is found in suitable habitat throughout Utah. Previous records from the Henry Mountains are from Starr Springs and Quaking Aspen Spring, both on Mount Hillers, and North Wash, 20 mi northwest of Hite (Hasenyager, 1980). We have 94 captures (in May, June, and August) of this most common species from nine sites ranging from 4,250 to 8,600 ft (1,295-2,621 m) in elevation (Table 1). This bat is known to roost in abandoned buildings and females form maternity roosts in trees. Koopman (1989) noted that North American *E. fuscus* likely is the same species as the Old World *E. serotinus*. The subspecies occurring in Utah is *E. f. pallidus*.

Euderma maculatum.— It seems likely that spotted bats occur statewide in Utah, although records are lacking from many areas. They are probably more common than generally believed as they are known to forage well above ground (Wai-Ping and Fenton, 1989), coming within range of mist nets only when they drink. We are aware of nearby records from Capitol Reef National Park and Natural Bridges National Monument (Bogan, unpublished data). We captured a gravid female at Mud Spring (7,750 ft; 2,362 m) on Mount Pennell on 19 June 1995 (Table 1; Fig. 5). We believe we heard the audible echolocation calls of this species at several other locations as well. Best (1988) studied geographic variation in the species and found that southern bats were largest, western bats smallest, and northern and central bats were intermediate in size; he nonetheless considered *E. maculatum* to be monotypic.

Corynorhinus townsendii.— Townsend's big-eared bat can be found in suitable habitat throughout Utah. The nearest records to the Henry Mountains (Hasenyager, 1980) are from Robbers Roost on the east side of the Dirty Devil River, and near Blanding in San Juan County. We captured 16 individuals at six locations ranging from 4,250 to 7,860 ft (1,295-2,396 m) in elevation; late season captures tend to be at upper elevations (Table 1). Utah bats of this species belong to the race *C. t. pallescens*. We follow Frost and Timm (1992) and Tumlison and Douglas (1992) in using *Corynorhinus* for North American long-eared bats.

Idionycteris phyllotis.— This species is likely more common than generally recognized in this portion of Utah. We are aware of records from both Capitol Reef National Park and Natural Bridges National Monument (Bogan, unpublished data). There are no previous records of Allen's big-eared bat for the Henry Mountains. We netted nine individuals (all female, some gravid) at four localities ranging in elevation from 4,720 to 7,860 ft (1,439-2,396 m); late season captures tend to be at upper elevations (Table 1). Tumlison (1993) assigned individuals from southern Utah and northern Arizona to a new race, *I. p. hualapaiensis*; we continue to consider this species monotypic at present.

Antrozous pallidus.— There are records of the pallid bat from the southern two-thirds of Utah (Hasenyager, 1980). In the Henry Mountains, we found this species to be moderately common, especially at lower elevations. We captured 20 individuals at nine localities ranging from 4,250 to 7,860 ft (1,295-2,396 m) in elevation (Table 1). There is some suggestion in our data that pallid bats occur at higher elevations later in the summer. The race occurring in Utah is *A. p. pallidus*.

Nyctinomops macrotis.— Available records (Hasenyager, 1980) suggest that the big free-tailed bat occurs in suitable habitat throughout southern Utah. We are aware of reproducing females captured at Natural Bridges National Monument (Bogan, unpublished data). The only capture record of this species in the Henry Mountains region, of which we are aware, is from near the former community of Giles, on the Fremont River, west of Hanksville (Matt Obradovich, in lit.). The high bluffs near this site and the canyons of the lower Dirty Devil River and middle Bullfrog Creek are several locations in the region seeming to provide suitable roosting sites for this rarely captured bat.

Tadarida brasiliensis.— Specimen records suggest that the Brazilian free-tailed bat can be found statewide in Utah, except in the most northern counties (Hasenyager, 1980). The records nearest to the Henry Mountains are at least 75 miles west, in Piute and Beaver counties. We took 50 individuals at three localities in the Henry Mountains; capture elevations ranged from 4,380 to 7,580 ft (1,335-2,310 m) (Table 1). The bulk of our captures were on 19 May 1996 at Placer Reservoir No. 1, where we netted 8 females and 36 males. It is likely these individuals were migrating.

DISCUSSION

During our work on bats of the Henry Mountains we captured 15 species, confirming the occurrence of six previously reported species and adding new records for nine additional species. There is an unconfirmed, but probable, record of one additional species (*N. macrotis*), but we know of no evidence for the present occurrence of *L. blossevillii* or *M. lucifugus* in the region. Of the 16 species known to occur, nine are Species of Concern (U. S. Fish and Wildlife Service former Category 2 Candidate Species): *M. ciliolabrum*, *M. evotis*, *M. thysanodes*, *M. volans*, *M. yumanensis*, *E. maculatum*, *C. townsendii*, *I. phyllotis*, and *N. macrotis*. Although our data should be interpreted cautiously, pending additional information on bats of this area, they nonetheless suggest that some of these species are more common and widespread in the region than perhaps is generally believed. *Myotis evotis* in particular is common and we believe that, excepting *M. ciliolabrum*, other species of *Myotis* are reasonably common as well. The occurrence of *M. lucifugus* in the area remains conjectural.

Several of these species are known to roost in abandoned mines, and surveys for these species (and others) should be conducted prior to closing abandoned mines (Riddle, 1995 and papers included therein). Likewise, some species roost in trees and the needs of these species, especially pregnant or lactating females that use such roosts, should be incorporated into local forest management plans (Barclay and Brigham, 1996). Finally, all species, as demonstrated by our netting results, use pools of water to meet critical water needs in an arid environment. Of the 22 sites netted, no more than seven might be considered permanent water, whereas the other 15 clearly are not. Among the latter sites are placer mine reservoirs, stock tanks to which water is either hauled or seasonally diverted, and stock tanks designed to opportunistically impound stormwater. In several instances these sites were netted, with very good results, the only time they held water during the four-year study period. Bats will find water if it is available. We urge those managing the land to continue to provide such sources of water for bats, in addition to livestock and other wildlife.

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